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COSTS AND EFFICIENCY IN MILK PRODUCTION 1960–1962

A Report of the National Investigation into the Economics of Milk Production

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FOREWORD

Dairying is the most important of the many enterprises in British farming. For many years therefore, the economics of milk production has been of great concern to the farmers whose livelihood it is, to agricultural students, research workers, and the organizations and firms which are part of the dairy industry.

This publication reports on a sample of dairy farms throughout England and Wales which kept records of their expenses and sales from 1960 to 1962. From these records it has been possible to derive average costs, returns, and profit margins from milk production, and to measure the variations in them. These variations have been considered in relation to such factors as size of herd, yield per cow, and level of feeding.

Since the previous report was published four years ago, there have been changes in the prices received and paid by dairy farmers, and improvements in their technical and managerial skills. It is hoped that this booklet will assist in the maintenance of the up-to-date knowledge that is so important in these fast changing times. A summary of the findings will be found on pages (35 and 36).

This report is a product of the National Investigation into the Economics of Milk Production. The conduct of the Investigation and the preparation of the report were primarily the responsibility of a Sub-Committee of the Conference of Provincial Agricultural Economists. Section V has been written by Dr. K. G. Cowling, Agricultural Economics Department, University of Manchester.

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INTRODUCTION

The National Investigation into the Economics of Milk Production, which was first undertaken in 1934, and which is sponsored and financed jointly by the Milk Marketing Board of England and Wales and the Ministry of Agriculture, Fisheries and Food, is undertaken by the Provincial Agricultural Economists at ten universities in England and Wales.*

The investigation alternates between three-year periods of general research† and two-year costings periods‡. The results of the latest costings period, which ran from April 1960 to March 1962, form the subject matter of this report. It is hoped that these results, and the commentary on them, will be a useful source for those who wish to become more informed about dairy farming, and to gain an insight into the productivity and profitability of this very important branch of agriculture.

Three warnings need to be given at the outset. As will be shown in the first chapter, the farms in the study were not selected at random and are not entirely typical of all the dairy farms in the country. This was both unavoidable and purposive. Unavoidable because some characteristics of the farms could not be gauged until they had been studied, and—more importantly—because the co-operation of the dairy farmer, which involves a certain amount of careful record keeping, had to be obtained; purposive because the greatest proportion of total milk production takes place on the larger dairy farms, and so a greater proportion of these were necessarily included in the sample. Although the distorting effects of the size distribution could be allowed for (as in table 8), other biases could not.

Secondly, within dairying itself, there is a danger of seeing simple cause and effect relationships between inputs and profits which would not necessarily be reproduced on every individual farm. The form of the tables unavoidably encourages this mistake, but it should be borne in mind that in these survey examples, unlike the controlled experiments of the physical scientists, inputs other than those being investigated will have varied, not least among them the important one of management.

Finally, the economics of milk production are bound up with the other enterprises carried out on the same farm. This study deals only with the milking herd, and in some cases maximum profits from the dairy herd would not provide maximum profits from the farm as a whole. This would arise if money at present spent on dairying could give a greater return in some other enterprise.

Shortly after the start of the 1960–62 costings period, the Milk Marketing Board carried out a sample census of herds§. This showed that since 1955 the percentage of cows in herds of under 20 cows had dropped from 40 to 32 per cent, and had increased in herds of 40 cows and over from 24 to 31 per cent. According to a study in 1961¶ the average size of herd going out of production

*The addresses of Provincial Agricultural Economists are given in the Appendix.

†A synopsis of the results of the research undertaken in 1957-60 has been published in "Aspects of Dairy Economics", H.M.S.O. 1963, price 5*s.* 6*d.*

‡A report on 1955-57 costings period was published in "Costs and Efficiency in Milk Production", H.M.S.O. 1960.

§The National Dairy Herd. Interim Census 1960, Milk Marketing Board Production Division, Thames Ditton, Surrey.

¶Report of the Production Division No. 12, p. 91, Milk Marketing Board.

was only 14 cows: the smaller herds thus tended to either increase in size or go out of production. The information contained in this report shows that the larger and higher yielding herds tended to be more profitable on average. However, since herd size cannot always be increased without costly investment, nor high yields obtained without the possibly uneconomic use of concentrates, other methods of increasing the margin per gallon such as are indicated by the investigation, will often be found to be the most practicable way of increasing profits.

I. THE FARMS IN THE STUDY

Choosing the Sample

The sampling framework was chosen so that a selection of herds could be found which represented different sizes of herds and reflected the relative importance of dairying in different parts of the country. As was said earlier, and as is shown in table 1, the sample contained a higher proportion of large herds than existed in the country generally, although the most common herd sizes, from ten to thirty cows, were represented by 59 per cent of the sample compared with 57 per cent for all herds in the country. Table 1 also shows that the spread of the sample by Milk Marketing Board Regions broadly corresponded with the national distribution. The average milk yield of the cows in the sample, 831 gallons, was also greater than the national average, which is estimated to have been 765 gallons for all milk-selling farms in 1960/61.*

Other Features of the Sample compared with National Figures

Other features of the sample which can be compared with national figures are grade of milk, incidence of milk recording, method of breeding, and breed of cows. All but 8 per cent of the herds were selling T.T. milk, and about one third of them were being paid attestation bonus. A similar proportion of the national herd was receiving the bonus in 1960/61, although 15 per cent of all herds in the country were still non-T.T. There was an interesting difference in the reasons for non-payment of the bonus: some of the herds in the country as a whole had been compulsorily attested, unlike the sample herds which were not receiving the bonus because they had been attested for more than 6 years.

Although an estimated 25 per cent of all herds in England and Wales recorded milk yields through the National Milk Records or Private Milk Records schemes, and there is in addition a certain amount of independent recording, milk recording was probably more common in the sample where it was practised on three out of every four farms. Seventy per cent of the farms used A.I. solely and a further 20 per cent used both A.I. and natural breeding. A bull was usually kept in the larger herds, and only one-third of the farms with more than forty cows used A.I. exclusively. Very similar figures were obtained for all herds in England and Wales in the Milk Marketing Board census.

Friesians with 41 per cent, and Ayrshires with 20 per cent, were the most

*Report of the Production Division No. 11 p. 9, Milk Marketing Board.

TABLE 1

Distribution of Herds by Size of Herd, and M.M.B. Regions

Av. Size of Herd	Up to 9·9 cows	10–19·9 cows	20–29·9 cows	30–39·9 cows	40–49·9 cows	50–59·9 cows	60 cows & over	ALL HERDS
	per cent							
Sample Herds	6·6	35·9	22·9	13·7	8·0	5·5	7·4	100·0
National Herd	22·8	37·3	19·5	9·3	4·9	6·2*		100·0

M.M.B. Regions	Northern	North Western	Eastern	East Midlands	West Midlands	North Wales	South Wales	Southern	Mid Western	Far Western	South Eastern	ALL REGIONS
	per cent											
Sample Herds	14·4	15·0	7·6	7·6	11·8	5·3	6·3	7·2	4·9	8·9	11·0	100·0
National Herd	11·3	19·8	4·6	5·1	8·7	7·2	11·0	4·7	9·5	12·9	5·2	100·0

Source: 1960/61 *Sample and M.M.B. Census June* 1960

* 50 cows and over.

commonly found breeds in the sample. This reflects the national picture. There were, however, very nearly as many mixed herds as purely Ayrshire herds in the sample, and the former were more common than any other type in herds of under 10 cows. Channel Island and Shorthorn cows were also noticeably more common in small herds than in large where Friesians and Ayrshires predominated.

Description of the Farms

The study was confined to herds primarily concerned with the production of milk for sale wholesale and excluded herds with less than six cows. In 1960/61 detailed records were obtained from 527 herds, and in 1961/62 from 509 herds; 452 of these were in the sample for both years and a comparison of their performance in the two years is shown in table 4. The description of the sample in this chapter and most of the discussion of the results in the later chapters are based on the 1960/61 results, except where the 1961/62 figures were significantly different.

Details of the cropping and the stocking rates of dairy cows on farms of different sizes are given in table 2. Milk production was not the only activity on the farms in the sample, for even on farms of under 25 acres one-quarter of the acreage on average was not devoted to the milking herd. On farms of over 150 acres more than half the acreage was devoted to other enterprises, despite the greater size of dairy herd on the larger farms. A comparison of the total grassland acreages with the acres devoted to the milking herd shows that other livestock enterprises were present on the larger farms (though some of the difference is accounted for by the grass used by dairy replacements).* On the cropping side cereals were generally grown, and farms of 300 acres and over had in addition a significant acreage of cash roots.

In general gross rent or rental value per acre decreased with increasing size of farm, but in the largest size group this trend was reversed. Generally speaking there were more cows per livestock acre on the smaller farms, and stocking rates on farms of under 25 acres were 25 per cent higher than the average. The grassland area on farms was divided about equally between temporary and permanent grass, with the balance tilted in favour of permanent grass on farms under 100 acres and in favour of temporary grass on the larger farms.

Buildings and Equipment

Information was also obtained on the physical attributes of the dairy buildings on the sample farms. The type of housing is described in more detail—together with the method of milking—in a later section on labour, but it is interesting to note here changes in the position compared with the 1955–57 sample. It should of course be remembered that the composition of the sample itself has changed since 1955–57.

The majority of herds were still housed in cow sheds, although the proportion dropped from 85 per cent to 62 per cent. The incidence of yard and parlour more than doubled: they were found on over 30 per cent of the farms, while the number of herds kept out of doors throughout the year rose from 7 to 31.

*See definition of livestock acre in table 2.

TABLE 2

Description of Farms in the Sample 1960/61

Size of Farm (acres)	Under 25	25–49·9	50–99·9	100–149·9	150–199·9	200–299·9	300 and over	All Herds
No. of Herds	29	133	152	70	46	44	53	527
Av. Size of Farm	19	39	71	123	172	242	475	131
Av. Size of Herd	10·0	15·7	21·8	33·2	38·5	45·6	61·1	28·5
Av. Rent per Acre	£6 0*s.*	£4 13*s.*	£3 15*s.*	£3 15*s.*	£3 13*s.*	£3 4*s.*	£3 11*s.*	£3 14*s.*
Av. Rent per Farm	£112	£180	£268	£463	£631	£780	£1695	£481
	Acres per Farm							
Cereals	0·5	2·7	7·7	21·1	47·4	65·0	165·0	31·9
Cash Roots	0·1	0·8	0·9	1·8	5·6	6·2	33·3	5·1
Fodder Crops	1·0	2·8	4·3	6·2	9·5	11·8	22·9	6·9
Miscellaneous	0·1	0·3	0·5	1·0	3·5	4·6	14·2	2·5
Total Tillage	1·7	6·6	13·4	30·1	66·0	87·6	235·4	46·4
Permanent Grass	10·5	16·1	30·0	41·6	46·4	74·0	104·9	39·6
Rough Grazing and Orchards with Grazing Value*	0·3	0·3	1·5	1·5	1·3	3·5	4·2	1·5
Temporary Grass	5·6	14·7	24·7	46·4	54·4	72·9	121·4	40·4
Total Grassland	16·4	31·1	56·2	89·5	102·1	150·4	230·5	81·5
Roads, Buildings etc.	0·6	1·0	1·5	3·5	4·3	4·4	9·2	2·8
Total Acres	18·7	38·7	71·1	123·1	172·4	242·4	475·1	130·7
	per cent							
Total Tillage as per cent of Total Acres	9	17	19	24	38	36	50	35
Permanent Grass as per cent of Total Acres	56	42	42	34	27	31	22	31
Temporary Grass as per cent of Total Acres	30	38	35	38	32	30	25	31
Other	5	3	4	4	3	3	3	3
	100	100	100	100	100	100	100	100
Livestock Acres†	14·5	27·0	42·3	66·3	79·3	99·4	124·8	56·4
Livestock Acres as per cent of Total Acres	78	70	60	54	46	41	26	43
Livestock Acres per Cow	1·5	1·7	1·9	2·0	2·1	2·2	2·0	2·0

* Adjusted to equivalent acreage of permanent pasture.

† Livestock acres are the acres of grass, cereals, roots and other crops grown for the milking herd.

Nearly two-thirds of the farms used in-churn coolers compared with one-third five years previously, while the incidence of surface cooling dropped from just over half to one-third. About one in eight of all farms, whether with in-churn or surface coolers, used refrigerated water. The increase in

in-churn cooling of course paralleled the increased popularity of in-churn milking.

The use of boiling water or steam alone for sterilizing became less common, being used by only 6 and 14 per cent of farms respectively. The latter method was still quite popular, however, where there were large herds. Approved hypochlorite solutions were used on their own by just over half the farms compared with 37 per cent five years previously, and in conjunction with daily or occasional use of other methods by nearly one-fifth of the farms. One case of circulation cleaning was recorded, and the remaining 7 per cent sterilized by immersion in caustic soda.

The investigation also supplied information on the type of power used for lighting, milking, and food preparation. Lighting by oil lamps had virtually disappeared, and had generally been replaced by electricity. As a rule, electricity was also introduced when hand milking was discontinued, although about one in ten farmers still used internal combustion engines. On the other hand, the farms in the later sample placed less reliance on the use of power for food preparation than in those in 1955–57 sample. Except for those with less than 20 cows, where as before about one-quarter used powered machinery for this purpose, the use of tractors, electric motors, and internal combustion engines was less frequent, and the overall incidence of powered machinery for food preparation dropped from 52 to 36 per cent. This corresponds with the decrease in feeding of chopped roots and an increase in the use of bought concentrates at the expense of home-grown concentrates.

TABLE 3

Capital Invested in Dairy Cows and Equipment on Farms of Different Sizes, 1960/61

Size of Farm (acres)	Under 25	25–49·9	50–99·9	100–149·9	150–199·9	200–299·9	300 and over	All Herds
No. of Herds	29	133	152	70	46	44	53	527
Av. Size of Herd	10·1	15·7	21·8	33·3	38·5	45·6	61·1	28·5
Av. Size of Farm (ac)	19	39	71	123	172	242	475	131
	£	£	£	£	£	£	£	£
Capital* per Farm	775	1,153	1,623	2,473	2,878	3,419	4,585	2,128
Capital* per Acre	42	30	23	20	17	14	10	16
	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.
Capital* per Cow in:								
(i) Cows	67 13	65 18	67 11	68 2	66 15	68 5	68 7	67 12
(ii) Dairy Equipment	9 17	7 10	7 1	6 7	8 1	6 14	6 11	7 0
Total Capital* per cow	77 10	73 8	74 12	74 9	74 16	74 19	74 18	74 12
Capital Invested in Dairy Equipment per £100 Invested in Dairy Cows	14 11	11 8	10 9	9 7	12 1	9 16	9 12	10 7

* The figures refer to capital invested in Dairy Cows and Equipment only.

Capital Invested in Dairy Cows and Equipment

In order to take account of depreciation and appreciation, valuations were made of the dairy cows and dairy equipment on the farms studied. The dairy cows were written-in at market values, and bulls and dairy followers were ignored. The effect of the costs of transfers in and out of the herd are described later in the section on herd replacement policies. The dairy equipment included milking machines, dairy utensils and an appropriate share of feed preparation equipment. The capital invested in producing home-grown food was not included, and neither was landlord-type investment in cow sheds, etc. The figures in table 3 are the average of the opening and closing valuations.

On average about £75 was invested per cow, £68 in the cow itself and £7 in dairy equipment. The value of the cows did not vary significantly on the different sizes of farm. On the other hand investment in dairy equipment per cow did show economies of scale on the larger farms compared with those under twenty-five acres where the equipment per cow cost proportionally more. The higher figure for dairy equipment in the 150–200 acre group was caused by one farm which possessed a bulk tank. Excluding this farm brought the investment per cow in that group down to £6 19*s*.

II. MILK PRODUCTION COSTS AND RETURNS

Accounting Methods

So as to bring all the herds in the investigation on to a comparable footing, and to give clarity to the meaning of costs, returns, and margins, standard accounting methods and definitions were used throughout. It is important that these should be understood before the results are studied or comparisons made with farms costed in a different way.

The dairy herd, including dry cows but excluding permanent nurse cows and followers, was the unit for costing purposes. The grass, fodder crops, and home-grown cereals fed to the dairy cows were also costed, and the quantities of all feedingstuffs fed were collected by means of daily or weekly records. Home-grown feedingstuffs were charged at cost of production. This means that had the farmer taken the opportunity of selling them, and of buying in concentrates, the cost might have been higher; alternatively one can say that the profit from growing crops for feeding is included in the results of the dairy enterprise. Hours of labour spent with the dairy herds were recorded and hired labour was charged at cost to the farmer, whilst the farmer's own manual labour was charged at average hourly earnings for skilled stockmen. Records were also kept of the miscellaneous expenses incurred each week—such as repairs and renewals of equipment and veterinary expenses.

At the end of the costing year annual production costs were calculated from the weekly record sheets. To the direct expenses of the milking herd were added computations of the herd replacement and depreciation costs. Details of the methods of calculating these are given on pages 20–22 in which herd replacement costs are discussed. The residual manurial values of feedingstuffs, fertilizers and manures were ignored.

In calculating returns, milk sold wholesale, retailed, or fed to livestock

was valued at wholesale prices, net of M.M.B. transport deduction. Milk sold to employees or used in the farmhouse was valued at the maximum rates prescribed by the Agricultural Wages Orders. The return on calves produced, at actual sale price or market value at four days old, was set against costs to arrive at net farm costs.

Since an estimate of the value of the manual work of the farmer and his family was included in the net costs of production, the margins between the costs and returns represented the reward for the farmer's managerial skill and the interest earned on capital invested for milk production, but not the reward for unpaid labour. A number of the tables which follow show also the family incomes derived from dairying. Family income is the difference between costs and returns if no charge is made for the manual work of the farmer and unpaid members of his family. On some farms, particularly the smaller family farms employing little or no hired labour, it is a more realistic reflection of the farm profits obtained from dairying than is the margin between the net costs of production and returns.

Total and Variable Costs

The production costs calculated in this study are total costs, since they represent that proportion of total farm expenses—including overheads—which might fairly be charged against milk production in a detailed farm account. It is important to know this total cost, but it would not normally be used in budgeting and other farm management analysis techniques where only the costs directly attributable to a particular enterprise, and which vary when the enterprise is expanded or contracted, are considered. For the same reason, average total costs do not show the additional cost which would be involved if an extra cow were kept or an extra gallon produced, since these may often be done without, for example, increasing the labour force or providing additional housing. Total costs are however of importance to the farmer wishing to measure the absolute level of profitability of his dairy enterprise, or considering major policy changes.

Costs, Returns and Margins in 1960/61 and 1961/62

A summary of the costs, returns and margins for the 452 herds which were in the sample for both 1960/61 and 1961/62 is given in table 4.

Returns from milk were about 30 per cent higher than net farm costs, giving a margin per cow of between £25 and £30, or about 8d. per gallon. The greatest single cost, that of feeding, fell by £3 per cow between the two years. The farms in the sample had slightly reduced labour costs in the second year, since increases in wage rates were offset by a 10 per cent decrease in labour hours per cow. Miscellaneous costs in dairy production are of considerable importance, including as they do farm overheads, veterinary expenses, dairy sundries, and the depreciation and running expenses of the milking machine and other equipment. Herd replacement costs were equalled by the value of calves produced. Despite an increase in yield per cow between the two years, returns per cow fell because of the decline in the price received per gallon. Nevertheless margin per cow rose from £26 to £28 7*s.* and, because of the increase in size of herd, margin per herd rose considerably.

Details of average feed consumption in the two years are given in table 5. The reduction in feeding costs was mainly caused by a decreased consumption

TABLE 4

Costs, Returns and Margins for an Identical Sample of Dairy Herds in 1960/61 *and* 1961/62

	1960/61	1961/62	1960/61	1961/62
No. of Herds	452	452	—	—
Av. No. of Cows per Herd	29·1	31·4	—	—
Av. Yield per Cow (gal)	834	840	—	—
Labour Hours per Cow	100	89	—	—
	Per Cow		Per Gallon	
	£ s.	£ s.	*d.*	*d.*
Costs				
Feeds: Purchased	30 8	27 8	8·74	7·83
Home Grown	16 3	15 12	4·65	4·46
Grazing	9 13	10 2	2·77	2·88
Total	56 4	53 2	16·16	15·17
Labour	21 7	20 16	6·14	5·94
Miscellaneous	17 13	17 10	5·08	5·01
Herd Replacement	5 16	6 11	1·67	1·87
Gross Farm Costs	101 0	97 19	29·05	27·99
Credit: Value of Calves	6 12	6 7	1·90	1·82
Net Farm Costs	94 8	91 12	27·15	26·17
Returns	120 8	119 19	34·62	34·27
Margins	26 0	28 7	7·47	8·10
Family Income	35 6	37 5	10·14	10·64
	£	£		
Net Costs per Herd	2,751	2,875	—	—
Returns per Herd	3,508	3,765	—	—
Margin per Herd	757	890	—	—

TABLE 5

Quantities of Feeds Fed and Cost per Cwt, 1960/61 *and* 1961/62

	Average Quantities Fed				Avge. Cost per Cwt	
	1960/61	1961/62	1960/61	1961/62	1960/61	1961/62
	cwt per cow		*lb per gal*		*s. d.*	*s. d.*
Concentrates:						
Purchased	18·64	17·46	2·50	2·32	31 3	30 3
Homegrown	3·76	4·07	0·50	0·54	13 1	13 4
Total Concentrates	22·40	21·53	3·00	2·86	28 3	27 0
Hay	15·25	15·69	2·04	2·09	6 9	6 8
Straw	1·07	0·74	0·14	0·10	3 9	3 7
Roots and Green Fodder	11·18	9·87	1·50	1·31	2 5	2 2
Kale	36·41	26·00	4·88	3·46	1 8	2 0
Silage	40·63	45·81	5·44	6·09	2 5	2 2
Other Feeds	2·58	2·06	0·35	0·27	5 0	5 3

of purchased concentrates allied with a decrease in their cost per cwt. Hay was fed on nearly all farms, at an average rate of about $\frac{3}{4}$ ton per cow annually. When silage was included in the ration, it was fed at an average rate of about 3 tons per cow. On farms feeding kale, consumption fell from 50 to 40 cwt per cow.

Range of Production Costs

Because of the widely differing conditions under which farming is carried on in this country, and the great variations in the quality of the management of different farmers, average figures from farm surveys invariably lie within wide extremes. Table 6 and figure 1 show the variations in net farm costs found in this study, and it can be seen that they are no exception, with some herds having a cost per gallon twice as great as others. In fact, about 15 per cent of the herds were making an accounting loss, although when unpaid

TABLE 6

Ranges of Net Farm Costs per Gallon, 1960/61 *and* 1961/62

	1960/61		1961/62	
No. of Farms	527		509	
Av. Net Farm Costs per Gallon	27·35*d*		26·36*d.*	
Net Farm Cost (pence per gallon)	Distribution of Herds	Distribution of Production	Distribution of Herds	Distribution of Production
	per cent	per cent	per cent	per cent
Under 20	3·8	5·2	6·1	8·2
20–23·9	15·5	19·4	21·2	26·9
24–27·9	23·7	28·2	29·7	32·4
28–31·9	26·8	27·5	21·2	19·8
32–35·9	17·3	13·3	12·4	8·2
36 and over	12·9	6·4	9·4	4·5
	100·0	100·0	100·0	100·0

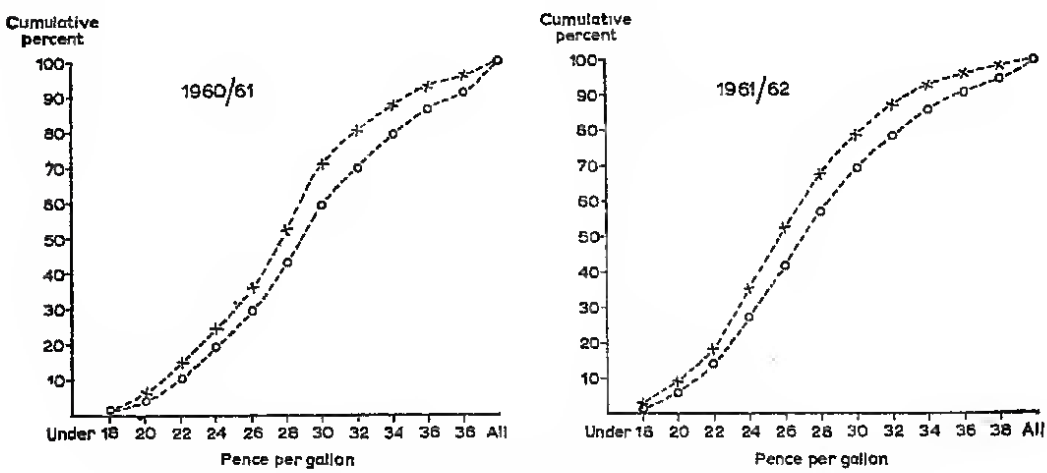


FIG. 1 *Variations in the Net Farm Cost, 1960/61 and 1961/62*

O= *Distribution of Herds* X= *Distribution of Production*

labour was not charged as an expense, many of these were breaking even. Others, where the farm was owner-occupied, might have had some surplus to show if the expenses of ownership were less than the imputed rent. As will be shown in Section III., the smaller herds and those with low yields per cow tended to have higher costs per gallon, and a result of this was that the proportion of milk production in the higher cost groups was smaller than the proportion of herds. The low cost herds were by no means all high-yielding or of large size, however, indicating a potential on many farms to earn substantially higher profits by other means, particularly improved husbandry and management.

Changes in Costs and Returns since 1955–57

There were 94 herds in the sample for which results were also obtained in the previous costing scheme in 1955–57. This is only a small proportion of the total, and is not entirely representative of the sample either in regional distribution or in average size of herd. Their results for 1960–62 are very similar to those of the whole sample, however, and their herd size was above the average by the same proportion then as it was in the earlier period. The figures can therefore be taken to give a valid account of the changes in costs and returns which have occurred since 1955–57. There were a few differences in the accounting methods used in 1960–62 compared with 1955–57 and the figures in table 7 have been adjusted to take account of them where possible.*

Since 1955/56, the average size of herd on the 94 farms increased by about 23 per cent, the average yield per cow increased by 40 gallons, and the average labour hours per cow decreased by about 19 per cent to 1960/61 and by a further 8 per cent to 1961/62.

Feed costs per cow vary from year to year and were at roughly the same level in 1960–62 as they were in the earlier period. Due to the increased yield, feed costs per gallon were slightly reduced. Labour costs increased only slightly, in the face of considerably increased wage rates. Miscellaneous costs also increased, and ended by rivalling labour as the second largest component of total costs. The improvement in replacement costs was mainly caused by the increased value of calves sold, although in addition the herd replacement cost in the earlier period was probably about £1 per cow higher than it would have been if replacements had been valued by the same method as was used in 1960-62.

Although returns dropped by 3*d.* per gallon between 1955/56 and 1956/57, the subsequent drop of 1½*d.* was offset by the increased output per cow which kept returns per cow at about the £120 level. Margins per cow therefore dropped between 1955/56 and 1956/57 because of lower returns, and between 1956/57 and 1960–62 because of increased costs, but nevertheless the increase in output kept margin per herd at nearly the same level. The increased output of milk in the country as a whole was in part self-defeating as it lowered the pool price received for it. Had it not been for the fact that some farmers did not increase output, and that others gave up milk production altogether, the drop in the pool price would have been greater. Lower costs were in general connected with increases in output, but some farmers managed to cut costs without expanding output. Costs were reduced on the sample farms,

*See A. J. Wynne, "Recent Changes in the Milk Costs Investigation Scheme and their Effects", Farm Economist Vol. X No. 2, 1962.

among other methods, by altering the combination of resources used—the reduction in labour used is an instance where considerable success was gained—and it is very evident that under present-day circumstances active steps need to be taken in the field of management to maintain or increase profitability as the relationships between prices received and paid alter.

TABLE 7

Costs, Returns and Margins for an Identical Sample of 94 *Herds,* 1955/56, 1956/57, 1960/61 *and* 1961/62

	1955/56	1956/57	1960/61	1961/62
No. of Herds	94	94	94	94
Average Size of Farm (ac)	169	171	172	171
Average size of Herd	30	31	36	37
Average Yield per Cow (gal)	799	804	835	839
Labour Hours per Cow	117	111	95	87

	Per Cow				Per Gallon			
	1955/56 £ *s.*	1956/57 £ *s.*	1960/61 £ *s.*	1961/62 £ *s.*	1955/56 *d.*	1956/57 *d.*	1960/61 *d.*	1961/62 *d.*
Purchased Feeds	30 8	26 8	30 9	27 8	9·14	7·88	8·75	7·84
Home Grown Feeds	17 19	16 17	16 18	16 3	5·40	5·04	4·86	4·62
Grazing	8 5	8 4	9 4	9 10	2·48	2·46	2·65	2·71
Total Feeds	56 12	51 9	56 11	53 1	17·02	15·38	16·26	15·17
Labour	19 8	19 2	20 17	20 19	5·83	5·71	6·00	5·99
Miscellaneous	14 2	13 15	17 10	17 13	4·24	4·10	5·03	5·04
Herd Replacement Including Credit for Calves	2 4	3 10	(–) 10	13	0·65	1·04	(–)0·14	0·19
Net Farm Costs	92 6	87 16	94 8	92 6	27·74	26·23	27·15	26·39
Returns	130 14	120 10	120 9	120 8	39·28	36·00	34·64	34·43
Margins	38 8	32 14	26 1	28 2	11·54	9·77	7·49	8·04
Family Income	44 1	40 8	32 14	34 9	13·24	11·47	9·40	9·86
	£	£	£	£				
Net Costs per Herd	2,796	2,740	3,372	3,450	—	—	—	—
Returns per Herd	3,959	3,761	4,302	4,502	—	—	—	—
Margin per Herd	1,163	1,021	930	1,052	—	—	—	—

Adjusted Estimates of Average Costs, Returns and Margins

The averages so far quoted refer only to the sample farms, and were calculated by dividing the total figures by the number of cows or gallons produced in the sample. Although they can be related to England and Wales as a whole in so far as the sample is broadly representative of dairying throughout the country, adjustments can be made to them to allow for the known differences between the sample and the national dairy herd. This has been done in table 8, with respect to the distribution by herd size, in an attempt to show more representative figures for the national herd. As was explained in the Introduction, there are probably other biases in the sample

which also have a small effect on the results. They are not so likely to affect the trend in the figures, however, and become less important when the figures are analysed to show the reasons for the different results of individual farms, and the ways in which improvements can be made.

TABLE 8

Results for the Sample Farms Adjusted to Reflect the Size Distribution of the National Herd, 1960/61 *and* 1961/62

	Per Cow				Per Gallon			
	Adjusted Results		Sample Results		Adjusted Results		Sample Results	
	1960/61	1961/62	1960/61	1961/62	1960/61	1961/62	1960/61	1961/62
	£ s.	£ s.	£ s.	£ s.	*d.*	*d.*	*d.*	*d.*
Purchased Feeds	31 8	29 1	30 6	27 13	9·10	8·41	8·76	7·92
Home-Grown Feeds	15 17	15 9	16 2	15 15	4·59	4·46	4·65	4·50
Grazing	9 14	10 1	9 14	10 2	2·82	2·90	2·79	2·90
Total Feeds	56 19	54 11	56 2	53 10	16·51	15·77	16·20	15·32
Labour	22 10	22 11	21 8	20 13	6·52	6·53	6·18	5·91
Other Costs*	17 6	18 1	17 4	17 18	5·02	5·22	4·97	5·13
Total Costs	96 16	95 3	94 14	92 1	28·05	27·52	27·35	26·36
Returns	119 15	118 17	119 16	119 14	34·71	34·38	34·59	34·28
Margins	22 19	23 14	25 2	27 13	6·66	6·86	7·24	7·92
Family Income	35 4	36 18	34 11	36 11	10·20	10·68	9·96	10·46
Av. Yield per Cow (gal)	828	830	831	838	—	—	—	—

*Miscellaneous and herd replacement costs, less value of calves sold.

As will be shown later, the smaller herds had greater feed and labour costs than larger ones. On the other hand herds with above 30 cows had lower yields on average than those in the 20–30 cow group, and so the returns per cow were not greatly depressed by the adjustment. The adjusted results therefore showed an increase in costs per cow of £2–3, and a reduction in margin per cow of £2–4. Because of the greater amounts of family labour in the smaller herds, however, the family income per cow was greater than in the straightforward sample results.

Relative Importance of Inputs

The figures in table 4 show that feed accounted for about 60 per cent of net farm costs, labour for just over 20 per cent, and miscellaneous costs for just under 20 per cent. Feed is outstandingly the input for which the greatest potential for savings exists, but labour and other costs are also very important. These components of total costs are discussed at greater length, together with herd replacement costs, in the later pages.

These inputs can be further broken down into what may be termed "primary costs", since, for example, the costs of home-grown feeds consist of labour, fertilizers, tractor fuel and repairs, and so on. If these costs are

allocated to the different resources which farmers buy, then the magnitude of the different types of farm expenses or the basic farming inputs is demonstrated, as in table 9.

TABLE 9

Primary Costs of Milk Production, 1960/61

	per cent
Manual Labour	32·6
Contract Services	1·0
Rent	9·4
Purchased Fertilizers	7·0
Purchased Feeds	29·6
Seeds	1·5
Machinery Depreciation and Repairs	6·9
Fuel and Oil	2·5
Miscellaneous	9·5
	100·0

III. FACTORS AFFECTING COSTS AND RETURNS

Despite the uncertainties of the weather and herd health, and in spite of a fixed price for his milk once it is produced, and shortage of capital, the dairy farmer has, or should have, a considerable degree of control over the costs and returns of his dairy herd. This chapter begins to "take apart" the average costs and returns found in the investigation, in order to see how the farms varied, and what effect this had on their performance. Only one factor has been taken at a time, with the result that other factors in a particular group of farms will be found to vary, and to have their own effect on the results. Despite this drawback, the results presented are useful pointers to the relationships involved in milk production, and can be of assistance to the farmer who wishes to increase his profit. But final decisions should always be taken according to the circumstances of each individual farm, which will never be an "average" farm and will not necessarily reproduce the relationships discernible in this study.

Size of Herd

Milk is produced in this country by herds of greatly differing sizes, and demonstrably can be profitable or unprofitable at all size levels. Herds of different sizes have varied advantages and drawbacks which should be carefully taken into account. In small herds, cows can be given more individual treatment, but there is a danger that such treatment may not always produce a tangible reward. Economies of scale are only possible in large herds, but are not always gained. Although a small margin per cow can yield an adequate income if a large enough number of cows is kept, such a herd is very vulnerable to small decreases in the profit margin, and may be yielding an uneconomically low return on the capital invested in it.

Table 10 shows the results of the sample herds, divided into groups according to herd size. In general the bigger herds used less labour per cow, and a smaller proportion was family labour. Home-grown concentrates

made up a greater proportion of total concentrates*, and more silage was fed; total food costs were lower. Average yield per cow was greatest in the 20–30 cow group, but was higher in the larger herds than in herds of under 10 cows. If these small herds had achieved a higher average yield, for instance by better response to feed, their family income per cow would have compared favourably with the bigger herds. The table also shows that margins, both per cow and per acre, were highest in herds with between 30 and 60 cows.

TABLE 10

Costs, Returns and Margins for Herds of Different Sizes, 1960/61

Size of Herd	5–9·9	10–19·9	20–29·9	30–39·9	40–49·9	50–59·9	60 and over	All Herds
Number of Herds	35	189	121	72	42	29	39	527
Av. Size of Herd	8·2	15·1	24·8	34·2	44·9	54·9	75·4	28·5
Av. Yield per Cow (gal)	752	820	855	846	830	807	826	831
Labour Hours per Cow	162	124	103	97	83	79	92	100
Percentage Unpaid Labour	95·9	79·7	56·9	32·3	25·5	18·5	5·9	44·0
	cwt per cow							
Purchased Concentrates	21·0	21·4	20·5	17·8	18·4	14·4	16·8	18·6
Home-grown Concentrates	1·5	1·8	2·6	4·4	3·8	6·0	5·5	3·8
Total Concentrates	22·5	23·2	23·1	22·2	22·2	20·4	22·3	22·4
Roots and Green Fodder	12·9	13·1	8·7	9·9	7·3	13·4	18·5	12·0
Silage	9·8	13·2	34·8	40·9	54·1	65·0	51·2	40·0
Hay and Straw	23·2	21·8	17·0	16·6	14·0	10·2	15·0	16·5
Kale	18·3	41·2	34·6	41·0	33·0	35·2	36·6	36·8
	Per Cow							
	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.
Total Feed Costs	60 10	59 7	59 11	54 8	56 0	49 2	54 6	56 2
Total Labour Costs	33 14	26 3	21 8	20 5	17 10	17 16	21 1	21 8
Other Costs*	20 2	17 8	16 13	17 1	15 18	16 10	18 12	17 4
Total Costs	114 6	102 18	97 12	91 14	89 8	83 8	93 19	94 14
Returns	109 14	120 11	123 11	121 18	119 3	114 0	118 1	119 16
Margin	(–)4 12	17 13	25 19	30 4	29 15	30 12	24 2	25 2
Margin per Livestock Acre	(–)2 3	9 2	13 4	15 10	15 0	14 16	12 2	12 13
Family Income per Cow	28 0	39 4	38 7	37 0	34 3	33 13	25 7	34 11
Family Income per Gallon	8·93*d.*	11·48*d.*	10·76*d.*	10·50*d.*	9·87*d.*	10·01*d.*	7·37*d.*	9·96*d.*
Family Income per Herd (£)	230 6	593 18	951 16	1,266 16	1,531 3	1,847 1	1,912 10	985 2
Standard Deviations:								
labour hours per cow	60	34	28	21	25	21	26	38
margin per cow	£23	£19	£18	£16	£15	£17	£28	£21

*See table 8.

*This affected the cost of the concentrates—see earlier section on Accounting Methods.

TABLE 11

Distribution of Herds by Size of Herd and Labour Hours per Cow, 1960/61.

Labour Hours per Cow	Size of Herd								
	5–9·9	10–14·9	15–19·9	20–29·9	30–39·9	40–49·9	50–59·9	60 and over	Total
Under 60		1	1	2	5	6	5	4	24
60–99·9		13	30	59	39	27	18	24	210
100–139·9	14	47	37	47	20	8	6	8	187
140–179·9	11	27	21	12	8	1		3	83
180–219·9	2	6	4	1					13
220–259·9	3	2							5
260–299·9	4								4
300 and over	1								1
Total	35	96	93	121	72	42	29	39	527

The distribution of herds by labour hours per cow and by size of herd in table 11 shows that labour economies, though more common in the larger herds, are possible in small ones. It seems likely that much of the family labour in small herds might have been better employed on other jobs. In a small business it is often difficult to match the family labour exactly to the work available for it. Some under-employment often occurs and it is important to consider ways and means of employing spare labour effectively. The introduction of a profitable sideline is one way; improving the quality of the cows or the layout of the building are others. Good cows will respond to closer individual treatment and thus increase profits, whereas the same labour spent on an inferior animal or in awkward buildings may lead to little or no gain.

TABLE 12

Distribution of Herds by Size of Herd and Margin per Cow, 1960/61

Margin per Cow	Size of Herd								
	5–9·9	10–14·9	15–19·9	20–29·9	30–39·9	40–49·9	50–59·9	60 and over	Total
Debit	23	24	12	9	2		1	2	73
£0–9·9	3	23	13	15	7	4	3	4	72
£10–19·9	5	9	22	23	9	9	5	7	89
£20–29·9	3	21	20	27	12	7	5	16	111
£30–39·9		10	14	17	23	11	5	2	82
£40–49·9		8	7	20	11	8	6	3	63
£50–59·9		1	3	3	6	2	3	4	22
£60 and over	1		2	7	2	1	1	1	15
Total	35	96	93	121	72	42	29	39	527

Table 12 shows the distribution of herds by margin per cow and by size of herd, and further emphasizes the possibilities of improving margins on herds of all sizes. It also shows the dangers of taking the averages in table 10 at their face value, since they conceal very wide variations between farms. These variations are expressed by the figures of standard deviation in table 10. Standard deviation is a measure of the spread of individual herd results around the average. As a rough guide, two-thirds of the herds will be found within one standard deviation from the average. The sandard deviations of margin per cow lay between £15 and £20 in most herd size groups, and the overall coefficient of variation was 84 per cent. The coefficient of variation is the standard deviation expressed as a percentage of the average. It is used to put the standard deviations of different items on the same footing so that they can be compared. The standard deviations of labour hours per cow lay between 20 and 30, but the overall coefficient of variation, 38 per cent, was less than half that for the margin per cow.

Yield

One of the most difficult problems facing dairy farmers is to know how much feed to give their dairy cows and what levels of yields to aim at. As the cost of feed is some 60 per cent of total production costs, increased efficiency in its use will improve the profitability of milk production. But yields can be affected substantially by levels of feeding; it is therefore frequently a moot point whether profits would be increased by feeding at higher levels to obtain higher yields, or by feeding at lower levels and accepting somewhat lower yields.

The problem will not be satisfactorily solved until more is known about the feed requirements of dairy cows. It is now widely agreed that the response of the dairy cow to different levels of feeding is subject to diminishing returns, but the problem is complicated by the varying capacity and efficiency of individual cows, the many possible combinations of feedingstuffs, and the varying skill of stockmen in feeding them.

TABLE 13

Distribution of Herds by Yield and Margin per Cow, 1960/61

Margin per Cow	Yield (gal per cow)							Total
	Under 600	600–699	700–799	800–899	900–999	1,000–1,099	1,100 and over	
Debit	11	22	18	13	6	3		73
£0–9·9	7	17	22	14	7	5		72
£10–19·9	6	21	25	26	9	2		89
£20–29·9	1	12	28	40	22	8		111
£30–39·9	1	9	13	27	15	13	4	82
£40–49·9		2	4	25	17	9	6	63
£50–59·9			1	9	8	3	1	22
£60 and over					5	6	4	15
Total	26	83	111	154	89	49	15	527

It is not surprising in these circumstances that many different feeding practices and levels of yield were found on the farms in the study, and that no one system was outstandingly the best. As is shown in table 13, big

margins per cow were achieved at both high and low levels of yield. The main ingredient of success was that the character and level of feeding matched the yield capacity of the cows. This is brought out in table 14, which compares the results for herds grouped by level of yield. Although diminishing returns to physical input are a fact for the individual cow, the cows in the over 1,100 gallon group were so managed or were of such quality, and the cost of food was such that they produced 17 gallons per £1 of total feed cost, while those in the lowest yield group produced only 13 gallons per £1. Thus although total costs per cow increased with increasing yield, returns per cow increased to a greater extent with the result that margins were improved. Margin per acre also follows the same pattern as margin per cow.

TABLE 14

Comparison of Results Obtained from Herds in Different Yield Groups, 1960/61

Gallons per Cow per Annum	Under 600 Gallons	600–699	700–799	800–899	900–999	1,000–1,099	1,100 and over	All Herds
Number of Herds	26	83	111	154	89	49	15	527
Av. Size of Herd	19·8	26·3	28·2	32·2	30·2	23·1	29·3	28·5
Av. Yield per Cow (gal)	540	662	748	843	956	1,044	1,146	831
Seasonality (% milk produced in winter months)	43·9	47·9	48·0	49·3	50·5	52·9	50·3	49·4
Labour Hours per Cow	90	97	98	97	105	110	115	100
Livestock Acres per Cow	2·10	1·91	1·96	1·97	2·11	1·91	1·84	1·98
	d.	*d.*	*d.*	*d.*	*d.*	*d.*	*d.*	*d.*
Margin per gallon	0·98	5·09	5·73	8·00	8·14	8·36	10·58	7·24
Family Income per gallon	6·30	9·03	8·90	10·26	10·38	11·17	12·43	9·96
	£ *s.*	£ *s.*	£ *s.*	£ *s.*	£ *s.*	£ *s.*	£ *s.*	£ *s.*
Total Feed Costs per Cow	41 1	46 8	52 17	55 15	63 2	70 15	68 13	56 2
Total Costs per Cow	78 7	83 18	90 14	92 16	104 3	112 17	113 11	94 14
Returns per Cow	80 11	97 19	108 11	120 17	136 12	149 5	164 1	119 16
Margin per Cow	2 4	14 1	17 17	28 1	32 9	36 8	50 10	25 2
Margin per Livestock Acre	1 1	7 7	9 2	14 5	15 7	19 2	27 9	12 13
Family Income per Cow	14 4	24 18	27 14	36 0	41 8	48 13	59 7	34 11

The effects of the different types of feeding practices are further discussed in Section IV.

Labour Usage

There was a wide range in recorded amounts of labour used for the dairy herds. The range, in labour hours per cow, is shown in table 15, together with the costs and returns of herds grouped by labour usage. In some herds

less than 60 hours per cow were used annually whilst in other herds more than 200 hours—or 25 eight hour days—were spent each year in looking after one cow. Labour is an important component of total costs, and reasons for its varying usage are given in Section V. Here it is shown that it can have a great effect on the amount of profit per cow. Again it can be seen that high labour use was associated with the smaller herds. Despite the poor or negative margins where large amounts of labour were used, the family income per cow remained satisfactory, and farmers in this position are not under great pressure to give up milk production.

TABLE 15

Variations in Labour Used per Cow, 1960/61

Labour Hours per Cow	Less than 60	60–99·9	100–139·9	140–179·9	180 and over	All Herds
Number of Herds	24	210	187	83	23	527
Av. Size of Herd	47·8	35·7	24·1	19·5	11·8	28·5
Av. Yield per Cow (gal)	807	815	857	854	800	831
Labour Hours per Cow	54	82	116	153	213	100
Per Cow:	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.
Total Feed Costs	50 16	53 11	58 3	64 11	64 6	56 2
Total Labour Costs	12 15	17 19	24 14	30 15	42 7	21 8
Total Costs	76 8	87 18	101 19	113 16	125 19	94 14
Returns	115 12	117 0	123 11	125 3	120 7	119 16
Margins	39 4	29 2	21 12	11 7	(–)5 12	25 2
Family Income	42 16	35 5	33 6	28 18	32 18	34 11

The importance of labour economy is two-fold. A reduction in labour costs per cow, if it can be achieved without reducing returns, gives a clear net addition to profits per cow. But equally important is the effect which labour saving can have on the size of the herd which can be kept or on the supplementary enterprises which can be introduced. Greater thought given to labour saving practices and wise choice in the use of labour saved, can make a substantial difference to the dairy herd and farm profit.

As is shown in table 16, the family income per cow is of course greater on family farms than on those employing hired labour. The latter tend however to be larger businesses, and the family income per herd was much larger on them.

Miscellaneous Costs

With costs in general rising, and the increased use of mechanical equipment and modern buildings, costs other than those of feed and labour have tended to increase in importance. In part, these increased costs have been necessary to achieve economy in the use of labour, but in order to maintain profit, they must be carefully scrutinized, and where possible must only be allowed to increase in substitution for other resources, such as labour, when the latter are more expensive. Some miscellaneous costs reflect the level of general farm overheads and so can only be tackled indirectly.

Of the £17 per cow spent on these miscellaneous costs, £2 went on milking

machine expenses, £9 as a share of general farm expenses, on other equipment, and as a charge for the buildings, £1 on artificial insemination, and £5 on veterinary charges and consumable dairy stores.

TABLE 16

Variations in the Proportion of Unpaid Labour used in Dairy Herds, 1960/61

Percentage of Unpaid Family Labour	All Hired Labour	per cent 1–19·9	20–39·9	40–59·9	60–79·9	80–99·9	100% Family Labour	All Herds
Number of Herds	67	75	52	68	51	56	158	527
Av. Size of Herd	50·6	41·5	37·0	25·3	25·9	18·9	15·9	28·5
Av. Yield per Cow (gal)	828	840	836	836	833	843	809	831
Av.Size of Farm (ac)	347	198	145	94	98	63	53	131
Labour Hours per Cow	92	93	90	103	108	104	118	100
	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.
Per Cow								
Total Feed Costs	54 12	54 8	55 15	57 18	55 14	60 9	57 14	56 2
Total Costs	94 18	92 16	91 11	95 0	92 19	100 13	97 10	94 14
Returns	118 19	121 3	119 7	119 19	120 18	122 16	117 14	119 16
Margins	24 1	28 7	27 16	24 19	27 19	22 3	20 4	25 2
Family Income	24 1	30 7	33 18	36 7	43 8	42 15	44 18	34 11
	£	£	£	£	£	£	£	£
Family Income per Herd	1,216	1,263	1,255	918	1,123	807	714	985

Herd Depreciation

Herd replacements costs were calculated by comparing the opening valuation of the dairy herd plus the cost of cows purchased and transferred into the milking herd, with the closing valuation plus the value of cows which were sold, died, or were transferred out of the herd. Home bred heifers entering the milking herd were valued at their estimated market value, exclusive of any special pedigree value. Purchased cows were valued at actual cost, and disposals were entered at the net price realized. The value of cows in the herd was kept constant until disposal, unless there was a major change in herd quality.

The net cost per cow was £6 in 1960/61, but this was offset by the value of calves produced, which came to £6 10*s*. This price reflects the popularity of calves which can be reared for beef. For comparison, some years earlier, in 1950/51, the value of calves per cow was only £2 10*s*. Where cross-breeding is practised it has the effect not only of increasing the value of the calf, but also of encouraging selective improvement in the quality of dairy replacements since unproven or low-yielding cows can be chosen to be inseminated by a beef bull.

The range in annual depreciation costs per cow (before the value of calves sold was deducted) is shown in table 17. This range was large, and is mainly

accounted for by differences between farms in length of herd life and in the value of cows sold. For example, better finishing of cows before disposal for slaughter can result in a higher selling price. A saving in depreciation of up to £10 per cow is a useful source of additional income, and opportunities of obtaining it should be taken wherever possible.

TABLE 17

Range in Depreciation Costs per Cow, 1960/61

		No. of Herds
Appreciation per Cow	£4 and over	3
	Less than £4	12
Depreciation per Cow	£0 to < £4	193
	£4 to £7·9	184
	£8 to £11·9	83
	£12 to £15·9	33
	£16 and over	19
Total		527

The key is reduced wastage, which opens the door both to savings in purchasing cows or rearing replacements, and to the possibility of selling more beef-cross calves, down-calving heifers, or cows in milk

A survey of disease in the British dairy herd was made in 1957–58*, and while there have been quite marked improvements in the health of dairy herds in the last 30 years, it is apparent that great improvements are still to be made. The report shows that the possible productive life of a cow, barring serious disease, infertility and the necessity to cull because of low yield, is eleven years. It is also known that a cow reaches its peak yield on average in its seventh lactation†, and therefore some measure of the possibilities is shown by table 18, which presents the distribution of the cows in the investigation

TABLE 18

Distribution of Cows According to Number of Completed Lactations, 1960/61

No. of Completed Lactations	*Per Cent of Cows*
0	20·0
1	18·8
2	16·6
3	13·9
4	10·6
5	7·3
6	5·0
7	3·2
8	2·2
9	1·1
10 and over	1·3
	100·0

*Disease, Wastage, and Husbandry in the British Dairy Herd, H.M.S.O. 1960.
†National Milk Records Annual Report, 1947, Milk Marketing Board.

according to the number of completed lactations at the end of the recording period. Although there has been some improvement in length of herd life in recent years, 70 per cent of the cows had not completed more than 3 lactations, and two-fifths had not completed more than one lactation.

The reasons why one quarter to one fifth of the cows were withdrawn from the herds each year are given in table 19. It can be seen that disease and low production accounted for 60 per cent of the disposals. Of the diseases, sterility and abortion were the most common, followed by mastitis, bloat, hypomagnesaemia, and milk fever. The incidence of all of these can be reduced by correct veterinary or feeding practices. Culling for low production is of course a necessity, especially where the quality of the cows in the herd is inferior, but if the difference in value between a purchased cow at say £80 and a diseased or barren cow at say £40 can be spread over 6 instead of over 3 lactations, the saving in depreciation would be considerable, despite a slightly lower price at disposal.

TABLE 19

Reasons for the Disposal of Cows from Milking Herds, 1960/61

No. of Herds	527
Av. Size of Herd	28·5
Av. No. of Disposals	6·0
Av. Value at disposal:	
Died	£7 4*s.*
Sold or Transferred out	£51 8*s.*
All	£48 1*s.*

Reasons for Disposal	Died	Sold or Transferred out	All	Av. No. of Completed Lactations
	per cent	*per cent*	*per cent*	
Mastitis	0·3	3·2	3·5	4·2
Sterility and Abortion	—	26·1	26·1	3·9
Test Failure	—	1·2	1·2	3·1
Johne's Disease	0·3	1·5	1·8	3·7
Other Diseases	4·1	2·0	6·1	3·5
All Diseases	4·7	34·0	38·7	3·8
Accident or Injury	2·1	2·1	4·2	3·8
Old Age	0·1	6·0	6·1	8·3
Low Production	—	22·7	22·7	2·8
Suckling	—	0·4	0·4	2·3
Fattening	—	6·4	6·4	3·3
For Profit	—	9·5	9·5	2·6
Other Reasons	0·9	11·1	12·0	3·0
Total	7·8	92·2	100·0	3·5

Fertilizer Usage

The farms in the sample used greatly differing amounts of fertilizers on their grassland, as is shown in table 20. The most profitable level of fertilizer usage depends on a variety of factors, important among which are

the soil type and fertility, the type of pasture, and the feeding and stocking policy. There were farms in the sample which applied little or no nitrogen, and yet were successful. On the other hand, application rates which might have been expected to increase profits did not always do so. This is because profitability ultimately depends not only on producing grass but also on utilizing it efficiently.

TABLE 20

Distribution of Farms according to Application Rate of Nitrogen to Grassland, 1960/61

Rate (lb N per acre)

	0	0·1–20	20·1–40	40·1–60	60·1–80	80·1–100	Over 100	All
% of Farms	3	22	27	25	12	5	6	100

IV. FEEDING PRACTICES

A major problem for the farmer is to decide upon the relative profitability of different feeding practices. A wide choice is open to him from the one extreme of feeding large quantities of concentrates and regarding his grassland as little more than an exercise ground for his cows, to the other extreme of depending entirely on grassland products and forage crops for both the maintenance and production rations. In other words the choice extends from complete self sufficiency to complete dependence on purchased feeds. It has already been shown that differences in feeding practices and yields obtained are a major cause of the variations in production costs and the margins obtained.

It might appear, therefore, to be a relatively simple task to establish from the results of the large-scale investigation which of the alternative feeding systems were the most profitable, but any analysis is made difficult by two considerations. First, conditions on individual farms vary so much that profitable feeding practices on one farm, might be entirely unsuitable to the conditions on another farm. Consequently, poor results from particular feeding practices on a farm might be due to the circumstances of that farm, rather than to any inherent weakness in the feeding system. The second, and often the more important difficulty, is that variations in the efficiency of management are as great or greater than the variations in the physical conditions of farms. Most systems of feeding can be made profitable by an efficient manager. Conversely, an inefficient stockman or dairy farmer will obtain poor results even from a feeding system ideally suited to the circumstances of his farm. Notwithstanding these difficulties, however, the study yielded some useful indications of the relative profitability of different feeding systems.

Cost of Feeds

There is a wide variety of alternative feedingstuffs available for dairy cows. Cereals, oil cakes, roots, green fodder and grass in varying forms are

all widely employed. During the investigation, information was obtained from the co-operating farmers on the costs of producing the various home-grown feeds. But since the nutritive content of feeds varies greatly, any comparison of costs must be based on their relative feeding value. This has been done in table 21 by showing the cost of producing a ton of starch equivalent from each of the main feed crops produced on the farms in the sample. The cost of starch equivalent obtained from dairy cake is also shown in the table.

TABLE 21

Estimated Average Costs of Production of Starch Equivalent for Various Crops, 1960/61*

Crop	Cost per ton of Starch Equivalent
	£
Grazing	16·4
Kale (grazed)	17·0
Hay	17·9
Grass Silage	20·5
Kale (carted)	25·6
Arable Silage	31·9
Mangolds	33·9
Turnips and Swedes	38·8
Barley	16·4
Oats	21·3
Standard Dairy Cake (63% S.E. at £30 2*s*. purchased price)	47·8

*These calculations refer only to the cost of producing the various feeds up to the point where they are available for feeding. Additional costs will be incurred in feeding them, but these are not likely to alter the relative costs significantly.

The cost of starch equivalent from grazing was calculated as the residual, after deducting the starch equivalent value of all other feeds from the conventional theoretical requirements for maintenance and milk production. Any overfeeding of concentrates—and there is evidence that this occurs—will reduce the calculated residual and so increase the cost per ton of S.E. from grazing. Nevertheless the table shows that grazing is the cheapest form of feed. There is of course a limit to the proportion of the requirements of a high-yielding cow that can come from grass, but it is clear that a saving is made for every pound of starch equivalent that comes from grazing instead of from purchased concentrates.

Meadow hay, grass silage, and grazed kale are also relatively cheap sources of starch equivalent. It is becoming standard practice to graze rather than cut and cart kale where field layout and soil allow this, and despite the greater utilized yield per acre when kale is carted, there are sound economic reasons for grazing it.

Home-grown cereals are also a relatively cheap form of starch equivalent, although additional costs for milling and mixing are incurred, and the profit from selling them is foregone when they are fed. Dairy cake, at nearly

£50 per ton of starch equivalent, is obviously an expensive form of supplying nutrients, and should only be used when alternatives are unavailable or impracticable, and the value of the milk derived from it is greater than the cost of the cake itself.

The choice of feed does not depend solely on the relative quality and cost of alternatives. As was suggested earlier, there is a limit to the intake of bulky feeds especially when high yields are being obtained. Other factors which must be taken into account are the output required per acre, the effect of the season of the year on the availability and cost of different feeds and the labour and equipment available for feeding them.

Some figures quoted by Dr. Blaxter* suggest that cows of low productivity (600 lb milk per lactation) respond to increased feeding at the rate of 1 lb milk per lb of starch equivalent, while high yielders (1,200 lb milk per lactation) can give an extra 2·1 lb milk per lb of starch equivalent. Applying the costs given in table 21 and pricing the milk produced at 2*s*., per gallon in May and 3*s*. 4*d*. per gallon in December leads to some revealing conclusions. While increased production from grass is profitable for both high and low yielders in May extra milk produced by feeding cake to low yielders in May loses money, and brings only negligible returns from high yielders. Feeding extra cake to low yielders is unprofitable even with December milk prices, and the profit gained from high yielders in December would be twice as much, if the starch equivalent were provided in the form of silage.

Systems of Feeding

The herds in the sample were classified into different groups according to the quantity of concentrates fed per gallon, and the yield of the cows. Thus a division was made depending upon whether yields were above or below 1,000 gallons and the type of feed—"traditional" or "bulk" was distinguished with the dividing line at 4 lb of concentrates per gallon in the winter and 2 lb per gallon in the summer. The costs, returns, and margins achieved under these different regimes are shown in table 22.

The average yield per cow in the "traditional" herds was 30 gallons higher than in the "bulk fed" herds, but the margin per gallon was so much lower that the "bulk fed" cows were more profitable than those in "traditional" herds on a per cow basis as well. The main difference was naturally in the feeding costs: although the "bulk fed" cows cost ten shillings more for home-grown feeds and thirty shillings more for grazing, £18 was saved in purchased feeds. A great deal of this difference must have been not so much in the money spent on grass and fodder crops, but in the production and utilization of those products by skilful use of fertilizers, strip or rotational grazing, and modern grass conservation methods.

Herds "bulk feeding" in both the summer and winter accounted for one-third of all the farms in the sample. Many of these were however feeding concentrates almost as heavily as the limit set in the classification. Greater than average success was achieved by the relatively few farms which had reduced their concentrate feediug to an even lower level, and yet had prevented their milk yield from falling too far.

Traditional methods of feeding were however successful on a number of herds where high yields were obtained. In the "high-yielding" group, an average

*"Feeding Standards for Livestock," Journal of the Farmers' Club, Part 2, 1959.

TABLE 22

Costs, Returns and Margins according to Systems of Feeding, 1960/61

	Bulk	Traditional	High Yielding	Bulk Fed, High Yielding	Winter Traditional, Summer Bulk	Winter Bulk, Summer Traditional	Total*
Number of Herds	179	128	52	10	71	75	527
Average Size of Herd	31·3	25·6	25·9	19·2	31·4	26·4	28·5
Average Yield per Cow (gal)	791	820	1,070	1,073	802	813	831
Labour Hours per Cow	94	108	113	98	96	103	100
Seasonality (% milk produced in winter months)	48·8	49·3	52·1	52·0	48·0	50·4	49·4
Livestock Acres per Cow	2·06	1·94	1·85	2·18	1·94	1·94	1·98
Margin per Gallon (d)	8·48	4·19	8·94	10·40	7·23	6·89	7·24
	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.
Total Feed Costs per Cow	48 9	64 14	70 16	63 5	53 6	56 11	56 2
Total Costs per Cow	85 6	106 2	113 9	106 11	91 5	94 8	94 14
Returns per Cow	113 4	120 8	153 1	153 1	115 8	117 14	119 16
Margin per Cow	27 18	14 6	39 12	46 10	24 3	23 6	25 2
Margin per Acre	13 11	7 7	21 7	21 7	12 10	12 3	12 3

Bulk: herds in which less than 4 lb of concentrates are fed per gallon in winter and less than 2 lb per gallon in summer, excluding high yielding herds.
Traditional: herds with a yield below 1,000 gallons per cow and a ration of at least 4 lb of concentrates per gallon in winter and 2 lb in summer.
High yielding: herds where the yield exceeds 1,000 gallons per cow, excluding bulk fed herds.
Bulk fed high yielding: bulk fed herds where the yield exceeds 1,000 gallons per cow.
Winter traditional, summer bulk: herds with a ration of at least 4 lb of concentrates per gallon in winter but less than 2 lb in summer.
Winter bulk, summer traditional: herds with a ration of less than 4lb of concentrates per gallon in winter but at least 2lb in summer.

*Including 12 herds for which the necessary details were not available.

yield of 1,070 gallons was achieved with an increase in feed costs of only £6 per cow over the "traditional" herds, so that the margin per cow was increased to nearly £40.

The small number of "bulk fed high-yielding" herds achieved the best of both worlds. With low feed costs per gallon—lower in fact than the rest of the "bulk fed" herds—and a yield per cow of 1,073 gallons, the margin on these herds was £7 per cow higher than in the traditionally fed high yielding herds. Both management and cows were of high quality, and though these results may be out of the reach of many dairy farmers, it is interesting to see that they were achieved on farms averaging only 80 acres.

That high yields do not necessarily mean high rates of purchased concentrates is shown in table 23, where it can be seen that nearly 20 per cent of the herds averaging at least 1,000 gallons per cow, used less than a ton of purchased concentrates per cow annually.

TABLE 23

Distribution of Herds by Yield per Cow and Purchased Concentrates per Cow, 1960/61

Yield (gal per cow)

Purchased concentrates per cow (cwt)	Under 600	600–699	700–799	800–899	900–999	1,000–1,099	1,100 and over	Total
Nil	1							1
1–4·9	1	3	1	2	3	1		11
5–9·9	9	14	10	15	6		1	55
10–14·9	7	26	33	19	6	4		95
15–19·9	5	25	28	51	19	5	2	135
20–24·9	3	9	21	34	21	7	1	96
25–29·9		5	13	20	26	9	2	75
30–34·9		1	3	13	6	14	4	41
35–39·9			2			5	4	11
40 and over					2	4	1	7
Total	26	83	111	154	89	49	15	527

Margin per acre was just over £21 in both the "high-yielding" groups, was maintained at £13 10*s*. in the "bulk fed" herds and was as low as £7 10*s*. in the "traditional" herds. In comparing these results some thought should be given to the effect of changes in the price of milk and concentrates, as they will bear on the alternative systems in different ways. A drop of 1*d*. per gallon in the price received for milk would affect the margin per acre in the two types of high yielding herds the most, and of these the traditionally fed "high yielding" more than the "bulk fed high-yielding" herds. Profit per acre would be least affected in the relatively low yielding "bulk fed" group, where it would only drop by 30 shillings per acre.

In all three types of herd, however, the drop would not be more than about 10 per cent of the margin, whereas the already low margins in the "traditional" herds would be reduced by a quarter. An increase in the cost of concentrates by £1 per ton would have a smaller but more severely differential effect. In the traditionally fed "high-yielding" herds it would cause a drop in the margin of 15 shillings per acre; the drop would be greater

in the "traditional" group than in the "bulk fed high-yielding" group while the "bulk fed" group would come off best with a drop of only 6*s.* 6*d.* per acre. Again the "traditional" herds would suffer the greatest proportional drop in their margin per acre, nearly 9 per cent compared with 2 to 4 per cent in the other herds.

A change over from one system of feeding to another should be made only after due consideration. The implications can be wide ranging, extending for example to housing, labour force, rotation and fertilizer practice. A reduction in feed costs per gallon may be accompanied by increases in other costs and a reduction in yield per cow.

Assuming that other costs are unchanged, profits will only increase if the advantages gained from lower feed costs are not offset by too great a reduction in yield. This relationship is given in figure 2 which shows the combinations of feed costs per gallon and yield per cow needed to give margins per cow of £30 and of £40 if costs other than feed are £38 per cow, and milk is sold at an average price of 2*s.* 11*d.* per gallon.

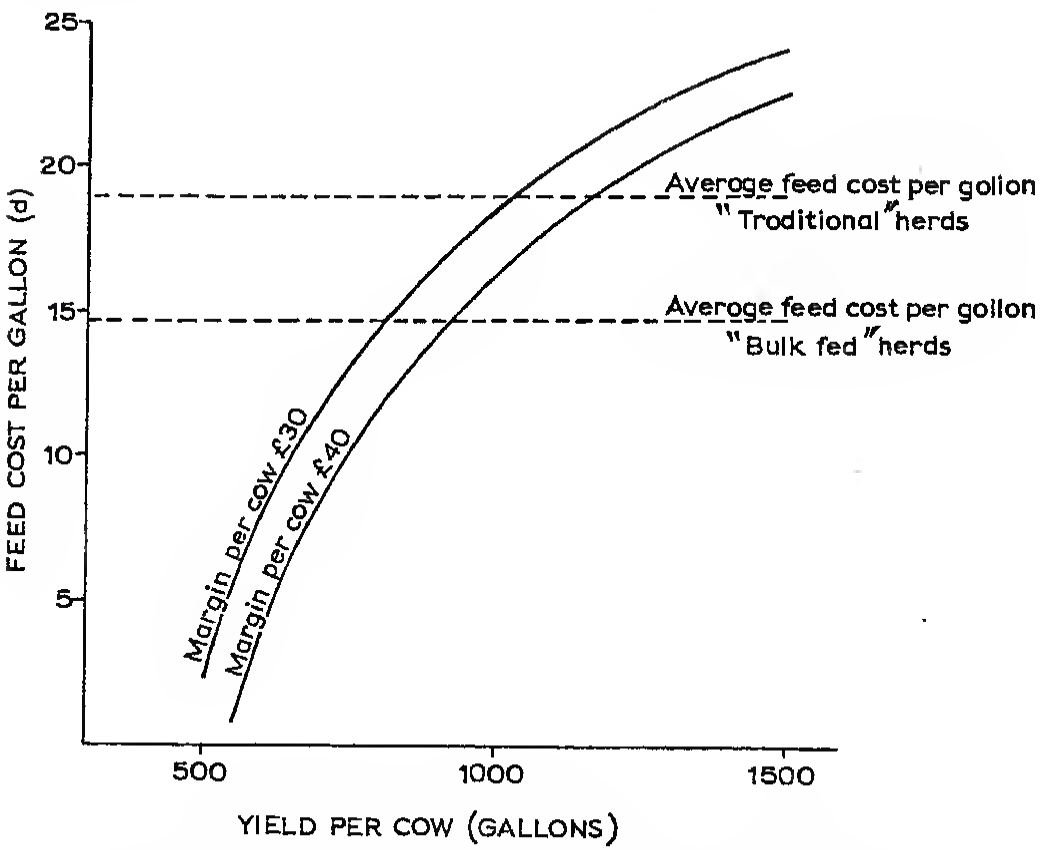


FIG. 2 *Margin per Cow at different Feed Costs per Gallon and Yields per Cow*

It can be seen that for a profit per cow of £30, herds with feed costs per gallon of 1*s.* 7*d.* (the average of the "traditional" herds) need an average yield of 1,000 gallons per cow. The traditional herds in the sample had an average yield of only 820 gallons per cow, so that the margin per cow was only £14. Given a 1,000 gallon herd with feed costs of 1*s.* 7*d* per gallon, and a desire to increase margin per cow, the figure shows that if feed costs are reduced to 1*s.* 3*d.* per gallon (the average of the "bulk fed" herd) advantage

will be gained so long as the yield does not drop below 800 gallons. The figure also shows that the output of milk can drop further, without jeopardizing margin per cow when the initial level of feed costs is high than when it is low.

Profitability of Feeding Concentrates

Although a change to bulk feeding, if conditions are favourable and management ability sufficient, can be very worthwhile, it is tempting to increase the size of the milk cheque by feeding greater amounts of concentrates. This solution appears particularly attractive in view of the apparent association between yield and margin per cow.

But whether the bank balance is increased as well as the milk cheque depends on the degree of response to the extra feeding. In table 24, the herds in the sample are grouped according to the concentrates fed per cow, and although it can be seen that average yield increases in the higher concentrate groups, the average margin does not. Indeed, except for the three herds feeding less than 5 cwt per cow, and the herds in 35–40 cwt group which had exceptionally high labour requirements, the group margins did not depart from the overall average by more than about £4. Similarly, no clear relationship can be seen between concentrates fed and margin per acre.

TABLE 24

Concentrates and Margins per Cow, 1960/61

Concentrates Fed Per Cow (cwt)	No. of Herds	Per Cow						Margin per acre
		Av. Yield (gal)	Labour Hours	Forage Acres	Costs	Returns	Margin	
					£ s.	£ s.	£ s.	£ s.
Nil	1	599	72	2·36	80 5	83 12	3 7	1 8
1–4·9	2	482	58	1·60	47 12	66 6	18 14	11 8
5–9·9	17	680	85	1·98	67 11	94 12	27 1	13 7
10–14·9	71	731	89	1·98	79 7	103 18	24 11	11 12
15–19·9	126	781	99	2·01	89 8	112 16	23 8	11 17
20–24·9	123	832	99	1·80	93 10	120 18	27 8	13 18
25–29·9	94	913	101	1·76	101 19	131 11	29 12	15 7
30–34·9	60	914	112	1·78	110 1	131 17	21 16	11 5
35–39·9	18	958	123	1·66	125 3	137 10	12 7	6 16
40 and over	15	1,028	107	1·63	123 11	150 9	26 18	13 7
All Herds	527	831	100	1·83	94 14	119 16	25 2	12 13

Table 25 shows the distribution of herds according to total concentrates per cow and margin per cow, and it can be seen that despite restriction of the concentrate ration to below 15 cwt per cow, a considerable number of herds had above average margins per cow. On the other hand there were herds in which concentrate feeding was kept at a low level, but in which, through high costs of other inputs and an inadequate supply of alternative feeds leading to too low yields, margins were at an unsatisfactorily low level.

TABLE 25

Distribution of Herds by Total Concentrates per Cow and Margins per Cow, 1960/61

Total Concentrates per Cow

Margin per Cow	Nil	1–4·9	5–9·9	10–14·9	15–19·9	20–24·9	25–29·9	30–34·9	35–39·9	40 and over	Total
Debit			3	6	19	16	11	10	6	2	73
£0–9·9	1	1	2	13	11	16	12	12	3	1	72
£10–19·9			2	16	26	26	11	7		1	89
£20–29·9			4	13	33	23	22	9	2	5	111
£30–39·9			4	11	20	16	13	10	4	4	82
£40–49·9		1	1	9	14	10	17	8	2	1	63
£50–59·9				1	3	13	3	1		1	22
£60 and over			1	2		3	6	2	1		15
Total	1	2	17	71	126	123	95	59	18	15	527

Density of Stocking

The range in the stocking density—from under 1 to nearly 4 acres per cow—is shown in table 26. This range is caused by differences in the management and productivity of grass and fodder crops, and in the degree of dependence on them for nutrients. The number of acres required per cow at a given level of feeding may be reduced either by improved production and utilization of grass and other home grown feedingstuffs, or by increased use of purchased concentrates. Neither of these methods on their own will necessarily increase margin per cow. The table shows that increased density of stocking resulted in significantly higher margins per livestock acre. Family income was also considerably higher on the intensively stocked farms. This was partly a reflection of the needs of the smaller farms, where intensive stocking was practised in order to increase the margin per acre to the level necessary to obtain a reasonable livelihood. Although the less intensively stocked farms were able on the whole to earn more for each £100 spent on the dairy herd, there is a danger that their margins per acre might compare unfavourably with the margins obtainable by using the land for other enterprises. The average margin per acre achieved in the sample as a whole was £12 13*s*.

Table 27 shows the differences between farms grouped according to the forage acres per cow, that is the livestock acres less home-grown cereals. These are a better measure of the grassland stocking rate, but the margin per acre is still calculated on the basis of livestock acres, since the return includes the profit on the home-grown cereals fed to the cows. Again it can be seen that margin per acre increased with density of stocking.

Seasonality of Production

Different feeding methods tend to be associated with differences in the seasonality of production. In order to make full use of grazing, summer milk has to be produced; on the other hand the cost of heavy concentrate feeding is best covered by milk produced at winter prices. Again it can be very profitable to feed cheap conservation products and receive a winter milk

price. Table 22 shows that while 49 per cent of the milk from "bulk" herds was produced in the six winter months, 52 per cent was produced then by the "high yielding" herds. Differences in seasonality tend to be small, because of the length of a cow's lactation, and also because of the practical difficulties of maintaining a highly seasonal calving pattern.

TABLE 26

*Variations in Livestock Acres per Cow**, 1960/61

Livestock acres per Cow	Under 1½	1½–2	2–2½	2½ and over	All Herds
Number of Herds	69	233	158	67	527
Average Yield per Cow (gal)	794	830	837	849	831
Average Yield per Acre (gal)	624	474	377	304	419
Livestock Acres per Cow	1·3	1·8	2·2	2·8	2·0
Average Rent per Acre	£4 5*s.*	£3 16*s.*	£3 14*s.*	£3 4*s.*	£3 14*s.*
Purchased Concentrates per Cow (cwt)	21·1	20·0	17·1	15·5	18·6
Home Grown Concentrates per Cow (cwt)	2·1	2·4	5·5	5·6	3·8
Roots and Green Fodder per Cow (cwt)	17·9	14·6	7·4	10·3	12·0
	£ *s.*	£ *s.*	£ *s.*	£ *s.*	£ *s.*
Margin per Livestock Acre	16 10	14 7	11 14	9 9	12 13
Family Income per Livestock Acre	24 18	20 3	15 9	12 10	17 9
Returns per £100 Costs	121 16	126 10	127 13	127 11	126 10

*Livestock acres are the acres of grass, cereals, roots, and other crops grown for the milking herd.

TABLE 27

*Variations in Forage Acres Per Cow**, 1960/61

Forage acres per Cow	Under 1½	1½–2	2–2½	2½ and over	All Herds
Number of Herds	108	251	127	41	527
Average Yield per Cow (gal)	840	829	824	837	831
Average Yield per Acre (gal)	660	478	374	305	455
Forage Acres per Cow	1·3	1·7	2·2	2·8	1·8
Average Rent per Acre	£4 0*s.*	£3 14*s.*	£3 10*s.*	£3 7*s.*	£3 14*s.*
Purchased Concentrates per Cow (cwt)	19·6	18·9	17·6	17·4	18·6
Home Grown Concentrates per Cow (cwt)	5·0	3·7	3·0	3·1	3·8
Roots and Green Fodder per Cow (cwt)	14·6	12·6	8·1	14·4	12·1
	£ *s.*	£ *s.*	£ *s.*	£ *s.*	£ *s.*
Margin per Livestock Acre	18 4	13 11	9 18	7 15	12 13
Family Income per Livestock Acre	24 3	18 10	14 1	11 9	17 9
Returns per £100 of Costs	128 17	119 11	124 12	122 12	126 10

* Forage acres are the acres of grass, roots and other crops (excluding cereals) grown for the milking herd.

Figure 3 shows the monthly pattern of milk production and prices in 1960/61, and it would seem that there might be profit to be gained from altering the seasonal pattern of production on some farms, bearing in mind the differences in cost and price for milk produced in different months. The summer months after June seem particularly open to the profitable production of milk off grass.

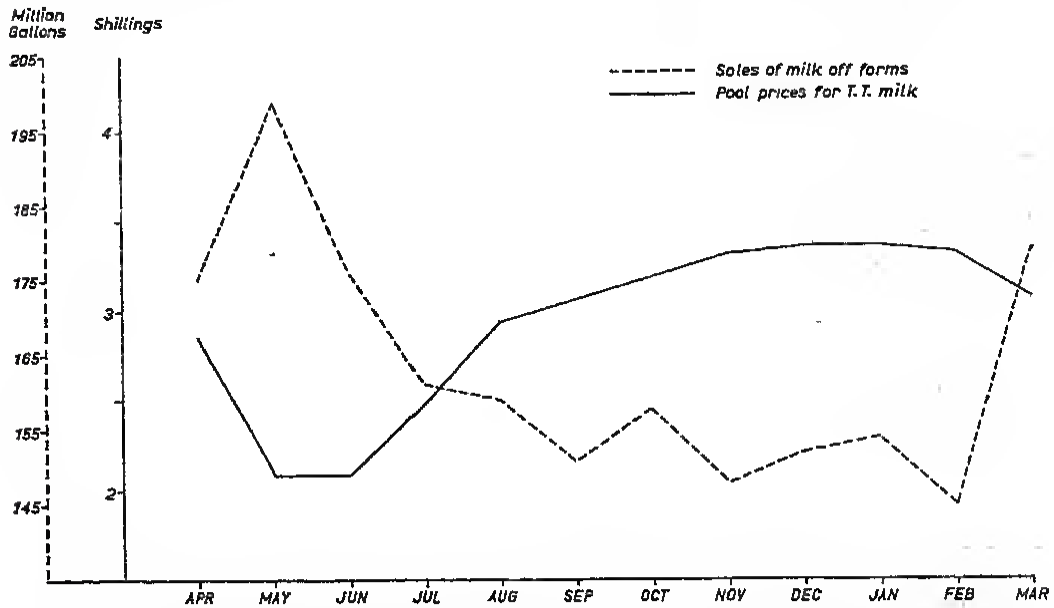


FIG. 3 *Sales of Milk Off Farms (England & Wales) and Regional Pool Prices for T.T. Milk in North Western Region, April 1960 to March 1961*

There was, however, little conclusive evidence from the results of the investigation about the relative profitability of concentrating on the production of either winter or summer milk. Profit margins increased as the proportion of winter milk increased to about 55 per cent of annual production, and margins then decreased as the proportion of winter milk increased still further. But the variations in the average profit margins were not likely to be due solely to the seasonality of production. This factor is only one of the many management decisions which combine together to determine the profitability of production.

The contribution of grazing to the feeding of the dairy herd was highest on the farms which concentrated on summer milk production. Indeed the choice between winter and summer milk production depends to some extent upon the amount of milk which can be obtained from grazing and the length of the grazing season. If a farmer with a limited acreage is able to provide little more than a maintenance ration from grazing, then it is probably profitable for him to concentrate on winter production, when the higher milk prices compensate him for the higher costs of feeding concentrates. On the other hand, farmers who are able to obtain a substantial part of the production ration from grazing, which can be the cheapest source of nutrients, might well have higher margins over feed costs during the summer, even though the prices for milk are much lower than in winter.

The most profitable alternative therefore, as in many other cases, depends upon the circumstances of the individual farm, and cannot be determined satisfactorily from an examination of the variations in costs and returns from

a sample of farms. The general statement is true, however, that success in a particular seasonal pattern of production depends on an assessment of the appropriate costs and returns, and adherence to the feeding practices and calving pattern that are necessary to achieve them.

V. LABOUR USE IN MILK PRODUCTION

Average yearly labour input per cow for the sample as a whole was 100 hours in 1960–61 and 90 hours in 1961–62. This is further illustration of the steadily declining trend in labour per cow, which has been evident in the post-war milk cost investigations. Table 28 refers to the years since 1947 in which data were collected.

TABLE 28

Labour and Herd Size 1947/48 *to* 1961/62

	1947/8	1948/9	1949/50	1950/1	1951/2	1955/6	1956/7	1960/1	1961/2
Average Labour hours per Cow	158	151	147	142	138	124	118	100	90
Average Herd Size	27·1	28·0	28·0	28·2	29·1	25·9	26·6	28·5	32·0

This increase in labour efficiency has been associated with an increase in herd size (although not a consistent increase as can be seen in the table) and with various housing, feeding and milking innovations. Both these factors might conceivably cause a decline in labour input per cow. However, the economies of scale associated with increasing herd size, as depicted in table 10 can be over-stated. Thus in 1960/61 the average labour requirements per cow for herds of 20 to 30 cows was 103 hours, whereas for herds of 40 to 50 cows the requirements were down to 83 hours per cow, but to say that in order to make substantial reductions in the costs of milk production, all that has to be done is to increase the number of cows kept is incorrect. This is because the larger herds in the sample are generally being operated under more efficient housing and milking systems. With this in mind a more complete analysis has been made of the data from the 1960/61 sample, in which the net influence of a particular factor was isolated after taking into account the other measurable factors.* The main results of the analysis are summarized as follows:

Factors Influencing Labour Requirements per Cow

1. *Herd Size:* The analysis failed to reveal any significant economies of scale associated with increasing herd size. Thus, given the existing system of milk production on a particular farm, the evidence suggests that we cannot except a reduction in labour hours per cow merely by increasing cow numbers. This finding seems to go contrary to much recent discussion of efficiency in milk production and requires further testing. However, the qualified statement might be made that economies of scale if present, are not a very important source of increased labour efficiency. This statement is to some extent substantiated by reference to table 28, where we see a consistent increase in labour efficiency throughout the period, whereas average herd size had declined quite appreciably between 1951/52 and 1955/56.

*See Keith Cowling, "Labour Input in Milk Production: An Analysis of the Quantitative and Qualitative Determinants", Farm Economist Vol. X No. 4, 1963.

2. *Average Yield per Cow in Herd:* Increasing yields would appear to lead to significant increases in labour requirements per cow (although this relationship can be looked at the other way round). An increase in yield of 100 gallons per cow gives an estimated increase in yearly labour requirements of 2 to 3 hours.*

3. *Milk Recording:* There is some evidence to suggest that the net effect of milk recording would be to increase the yearly labour requirements by 10 to 15 hours per cow.

4. *Feeding system:* Differences between feeding systems were measured by the quantity of roughage fed, but it was not possible by this means to show the expected effect on labour requirements.

5. *Housing/Milking Systems:* The relative importance of the different systems in the 1960/61 sample, with a breakdown according to number of milking units, is indicated in table 29.

TABLE 29

Housing and Milking Systems, 1960/61

Type of Housing	*Type of Milking*	*Number of Units*	*Number of Herds*
Cowshed	Cowshed buckets	2	145
,,	,, ,,	3	82
,,	,, ,,	4	49
,,	,, ,,	>4	19
Yard	Cowshed or milking shed ,,	2	22
,,	,, ,, ,, ,, ,,	3	25
,,	,, ,, ,, ,, ,,	4 or 6	8
,,	Parlour ,,	2	10
,,	,, ,,	>2	10
,,	,, in-churn	2	31
,,	,, ,,	3	16
,,	,, ,,	4	15
,,	,, ,,	5–6	9
,,	,, self releaser	2–3	15
,,	,, ,, ,,	4–8	9
Outdoors	Bail in-churn	2–3	6
,,	,, ,,	4–8	4

In addition there were 16 farms hand-milking and a few others with miscellaneous systems. For an identical sample of 452 farms in 1960/61 and 1961/62 the number of farms with cowshed housing/cowshed milking dropped from 258 to 247, and the number with yard housing/parlour milking increased from 100 to 108.

The cowshed system appears to be the least efficient from the labour standpoint. Under this system, increasing the herd by one cow gives an estimated additional yearly labour requirement of about 100 hours. The conversion of this system to the yard/cowshed system gives little evidence of improving labour efficiency, although this observation may result from the problems of transition and may not hold in the long-run.

All the parlour or bail systems give significant reductions in labour

*This accords quite closely with an experimental estimate made by F. H. Dodd of the National Institute for Research in Dairying.

requirements, the marginal input being reduced by the order of 50 hours per cow. There is some evidence to suggest that bail systems have the lowest labour requirements of all.

6. *Number and Type of Milking Units:* The estimated effect of variations in the number of milking units on labour efficiency is difficult to interpret, as it is the man : machine ratio which is probably of overriding importance and this was not measured in the investigation. There is some evidence to suggest that for bucket systems, 3 units give a significant improvement in labour efficiency as compared with 2 units, but that 4 units give no significant improvement. A possible explanation is that 4 unit-systems are associated with 2-man milking operations, but that 3 units can be controlled by one man.

Comparisons of bucket, in-churn and self-releaser milking systems have led to conflicting results. This may be because of the difficulty of defining accurately systems of milking, since these three groups on their own offer an inadequate description of the many alternative types in use.

7. *Other Non-Measured Factors:* Variation in the six factors considered above accounted for something like 80 per cent of the variation in labour input in milk production for the farms in the sample in 1960/61. Many factors important in labour efficiency on the individual farm have not been accounted for; for example such things as differences in feeding systems, man : machine ratios, distances involved in moving milk and feed, length of the winter feeding period, and efficiency of work routines. It has also to be remembered that the amount of labour recorded as used on the dairy enterprise may be subject to error, reflecting the labour available for this work, rather than that actually used.

Conclusions

The major conclusion which can be drawn from the analysis of labour use, is that for the individual farmer who plans to improve his labour efficiency in milk production, changes in system rather than in herd size would seem to be of first importance. Such decisions involve the substitution of capital for labour and must be viewed in the context of the relative scarcity of these resources and of the profitability of alternative uses of his capital.

SUMMARY

1. This report summarizes the results of a national investigation into the economics of milk production carried out between April 1960 and March 1962. Information was obtained in respect of about 500 dairy herds of various sizes throughout England and Wales. Although the sample of farms studied was not necessarily representative of all aspects of dairying in the country, it was broadly representative as far as size of herd was concerned, and it reflected the relative importance of dairying in different parts of the country. In addition to details of costs and returns under different systems of production, information was also collected about the breeds of cows kept and the buildings and dairy equipment available on the farms in the sample.

2. The results from an identical sample of farms in 1960/61 and 1961/62 showed a decrease in the net cost of production from £94 8*s.* 0*d.* to £91 12*s.* 0*d.*

per cow, owing mainly to reduced expenditure on purchased feeds. This was the result of a decrease both in price and consumption. Despite an increase in yield per cow between the two years, returns per cow fell because of the decline in the price received per gallon. Nevertheless, margin per cow rose from £26 to £28 7*s.* 0*d.*, and, because of the increase in the size of herd, margins per herd rose considerably.

3. Costs in both years ranged from less than 1*s.* 8*d.* per gallon to more than 3*s.* per gallon. The average cost per gallon in 1960/61 was 27·2*d.*, and in 1961/62 was 26·2*d*, and in the latter year nearly 50 per cent of all the milk in the sample was produced at a cost of hetween 1*s.* 11*d.* and 2*s.* 5*d.* per gallon.

4. A number of the farmers who co-operated in the study had taken part in a similar investigation in 1955–57. For an identical sample of 94 herds the average size of herd increased by seven cows; while milk yields increased by 40 gallons per cow. The average number of hours of labour required per cow declined by about 26 per cent from 117 to 87 hours. Consequently the average margin per herd in the later period was virtually maintained at the earlier level, despite increases in feeding costs and wage rates and a decrease in the average returns per gallon of 4½*d.*

5. The average margin per cow in the whole sample for 1960/61 was £25 2*s.* 0*d.* Margin per acre was £12 13*s.* 0*d.* The effects of herd size, miscellaneous costs, and herd depreciation are discussed in Section III.

6. To a large extent, the variations in cost, returns and margins from milk production arise from differences in feeding practices and yields obtained. Although there is a tendency for higher profit margins to be associated with higher yields, high yields at any cost are not profitable. The cost of feeding a cow giving high yields has an important influence on profit margins; only if the feed requirements can be provided sufficiently cheaply, is the objective of high yields per cow a profitable proposition for dairy farmers.

7. Grass grazed was the cheapest form of nutrient, followed by grazed kale. Root crops were shown to he a relatively expensive form of winter feed compared with cereals and grass products; but all the sources of home-grown feed if produced and used efficiently appeared to be cheaper than purchased dairy cake.

8. Different systems of feeding are discussed on page 25. "High-yielding" and "bulk fed" herds had the highest margins per cow and per acre. "High-yielding" herds stood to lose most if prices of milk or concentrates moved adversely, but their initially high margins would leave them with a satisfactory margin. Margins in "traditionally fed" herds were not only low but would be proportionately the worst affected by adverse price movements.

9. Labour economy is discussed in Section V. The system of housing and milking is shown to be more important than a simple increase in herd size in reducing labour cost.

Note.—Detailed tabulations of the results of this investigation for the period April, 1960, to March, 1962, will be made available to research workers on application to the Milk Marketing Board or the Agricultural Economics Division of the Ministry of Agriculture, Fisheries and Food.

APPENDIX

Names and Addresses of Provincial Agricultural Economists

PROVINCE	
Northern (*Newcastle*)	
Cumberland Westmorland Durham Northumberland	Professor J. Ashton, M.A., B.Litt., M.S., University of Newcastle upon Tyne, Department of Agricultural Economics, Newcastle-on-Tyne, 1
North Eastern (*Leeds*)	
Yorkshire	W. Harwood Long, M.A., Agricultural Economics Section, 40, University Road, Leeds, 2.
East Midland (*Nottingham*)	
Derby Leicester Lincoln (Kesteven) Lincoln (Lindsey) Northampton Nottingham Rutland	Professor D. K. Britton, M.A., B.Sc.(Econ.), Agricultural Economics Department, Nottingham University School of Agriculture, St. Michael's House, Sutton Bonington, Loughborough, Leics.
Eastern (*Cambridge*)	
Bedford Cambridge Essex Hertford Huntingdon Isle of Ely Lincoln (Holland) Norfolk Soke of Peterborough Suffolk	F. G. Sturrock, M.A., B.Sc., School of Agriculture, University of Cambridge, Cambridge.
South Eastern (*Wye*)	
Kent Surrey Sussex, East Sussex, West	Dr. G. P. Wibberley, B.Sc., M.S., Wye College, University of London, nr. Ashford, Kent.

Southern (*Reading*)

Berkshire
Buckingham
Hampshire
Isle of Wight
Middlesex
Oxford

Prof. E. Thomas, C.B.E., B.Litt., B.Sc.,
Department of Agricultural Economics,
University of Reading,
7 Redlands Road,
Reading, Berks.

Western (*Bristol*)

Gloucester
Hereford
Somerset
Warwick
Wiltshire
Worcester

S. R. Wragg, M.A.,
Agricultural Economics Department,
University of Bristol,
79 Woodland Road,
Bristol, 8.

South Western (*Exeter*)

Cornwall and
Scilly Isles
Devon
Dorset

S. T. Morris, M.Sc.,
Department of Economics
(Agricultural Economics),
University of Exeter,
1 Courtenay Park,
Newton Abbot, Devon.

North Western (*Manchester*)

Cheshire
Lancashire
Shropshire
Stafford

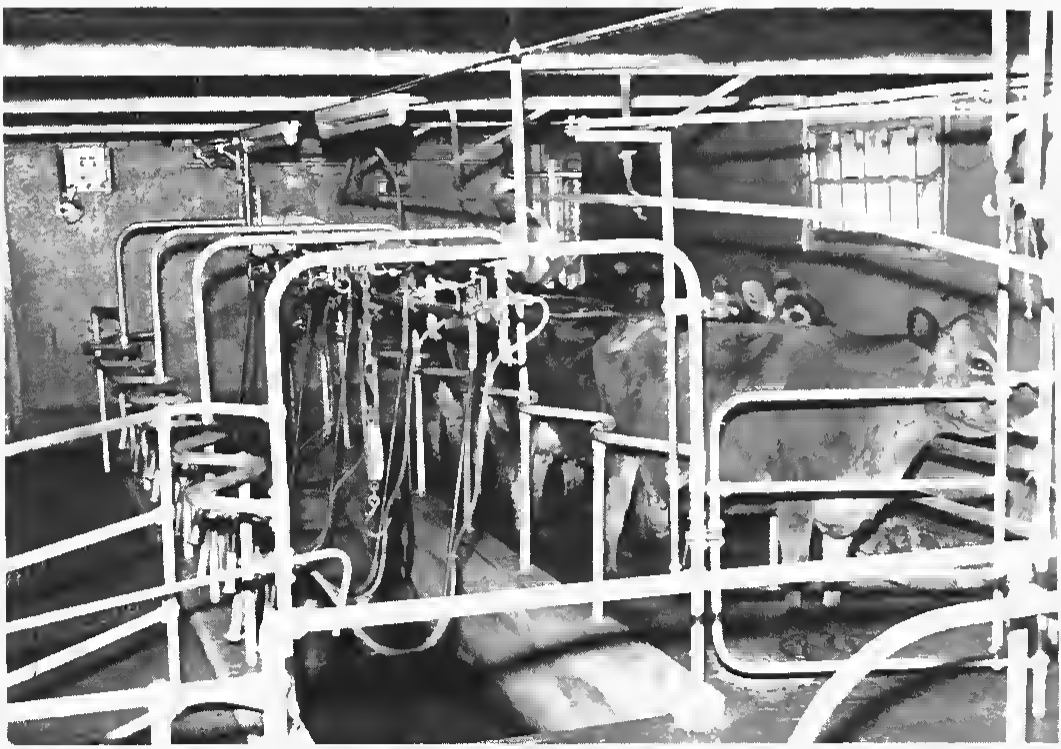
W. J. Thomas, M.Sc.,
Agricultural Economics Department,
The University,
Manchester, 13.

Wales (*Aberystwyth*)

Professor H. T. Williams, B.A.,
Department of Agricultural Economics,
Cambrian Chambers,
Cambrian Place,
Aberystwyth, Cards.

Wt. 4541/7940 K32 6/64 (951)

Yard, parlour, and covered silo



Herring-bone parlour

Miscellaneous costs, which include depreciation of buildings and equipment, have become a larger element of total costs

(*Photos: Farmer and Stockbreeder*)

PLATE I

Cows self-feeding silage

Cow cubicles

Successful methods of reducing the cost of providing food, and comfort.

(*Photos: Imperial Chemical Industries Ltd.*)

PLATE II

Strip-grazing a ley

Taking the temperature of ensiled grass

Efficient utilization of grass is as important as its successful production.

(*Photos: Imperial Chemical Industries Ltd.*)

PLATE III

Using a strip-cup

(*Photo: Farmer and Stockbreeder*)

Making-up accounts

Both the physical and the financial health of the herd merit careful attention.

PLATE IV

MINISTRY OF AGRICULTURE, FISHERIES AND FOOD
September 1964

Costs and Efficiency in Milk Production
1960-62

CORRECTION

Page 25, Second paragraph, 2nd and 3rd lines:

After "600" and "1,200" respectively, insert "gallons" and delete "lb".

Page 33, Last paragraph, 4th line:

Amend "except" to read "expect".

LONDON: HER MAJESTY'S STATIONERY OFFICE